

CLAIMS

1. An artificial magnetic conductor (AMC) comprising:
a frequency selective surface (FSS) having an effective sheet capacitance
which is variable to control resonant frequency of the AMC.
2. The AMC of claim 1 wherein the FSS comprises a single layer of
conductive patches disposed on a dielectric layer.
3. The AMC of claim 2 further comprising:
voltage variable capacitors between selected conductive patches.
4. The AMC of claim 3 wherein the voltage variable capacitors
comprise microelectrical-mechanical system (MEMS) based variable
capacitors.
5. The AMC of claim 3 wherein the voltage variable capacitors
comprise varactor diodes.
6. The AMC of claim 5 further comprising:
ballast resistors between the selected conductive patches.
7. The AMC of claim 5 further comprising:
a conductive backplane structure; and
a spacer layer separating the FSS and the conductive backplane structure,
the spacer layer pierced by conductive vias electrically coupling
bias signals between the conductive backplane structure and
adjacent conductive patches.
8. The AMC of claim 1 wherein the FSS comprises:

a first layer of conductive patches disposed on a first side of a dielectric layer;
a second layer of conductive patches disposed on a second side of the dielectric layer, portions of the second layer of conductive patches overlapping portions of the first layer of conductive patches; and
radio frequency (RF) switches between selected patches of the first layer of conductive patches.

9. The AMC of claim 8 wherein the RF switches comprise PIN diode switches.

10. The AMC of claim 8 wherein the RF switches comprise microelectrical-mechanical system (MEMS) switches.

11. The AMC of claim 8 further comprising:
a conductive backplane structure; and
a spacer layer separating the FSS and the conductive backplane structure, the spacer layer pierced by conductive vias electrically coupling bias signals between the conductive backplane structure and adjacent conductive patches.

12. An artificial magnetic conductor (AMC) comprising:
a frequency selective surface (FSS);
a conductive backplane structure;
a spacer layer separating the conductive backplane structure and the FSS, the spacer layer including conductive vias extending between the conductive backplane structure and the FSS; and
voltage variable capacitive circuit elements coupled with the FSS and responsive to one or more bias signal lines routed through the conductive backplane structure and the conductive vias.

13. The AMC of claim 12 wherein the FSS comprises a dielectric layer with a single layer of conductive patches disposed on a side of the dielectric layer.

14. The AMC of claim 13 wherein conductive patches of the layer of conductive patches are substantially square.

15. The AMC of claim 13 wherein first predetermined conductive vias are arranged to electrically couple a bias voltage line and respective adjacent conductive patches and second predetermined conductive vias are arranged to electrically couple a ground plane and respective adjacent conductive patches.

16. The AMC of claim 12 further comprising ballast resistors coupled in parallel with the voltage variable capacitive circuit elements.

17. The AMC of claim 12 wherein the conductive backplane structure comprises a stripline circuit with one or more bias control signals routed in between ground planes of the stripline circuit.

18. The AMC of claim 12 wherein the conductive backplane structure comprises a stripline circuit and distributed or lumped RF bypass capacitors inherent in the design of the stripline circuit.

19. The AMC of claim 12 wherein the FSS comprises a dielectric layer with a first layer of conductive patches disposed on one side of the dielectric layer and a second layer of conductive patches disposed on a second side of the dielectric layer to at least partially overlap conductive patches of the first layer of conductive patches.

20. The AMC of claim 19 wherein a first subset of the conductive vias electrically couple a first bias signal line and associated conductive patches according to a first pattern on the one side of the dielectric layer and a second

subset of the conductive vias electrically couple a second bias signal line and associated conductive patches according to a second pattern on the one side of the dielectric layer.

21. An artificial magnetic conductor (AMC) comprising:
a frequency selective surface (FSS) including a periodic array of
conductive patches;
a spacer layer including vias extending therethrough in association with
predetermined conductive patches of the FSS; and
a conducting backplane structure including two or more bias signal lines,
the AMC characterized by a unit cell including
in a first plane, a pattern of three or more conductive patches, one
conductive patch electrically coupled with an associated conductive
via, and voltage variable capacitive elements between selected
laterally adjacent conductive patches; and
a conductive backplane segment extending in a second plane substantially
parallel to a plane including the three or more conductive patches
and
the associated conductive via extending from the one conductive patch to
one of the two or more bias signal lines.

22. The artificial magnetic conductor (AMC) of claim 21 wherein the
two or more bias signal lines include a ground line and a bias voltage line.

23. The artificial magnetic conductor (AMC) of claim 21 wherein the
periodic array comprises a square lattice of four conductive patches.

24. The artificial magnetic conductor (AMC) of claim 21 wherein the
voltage variable capacitive elements comprise varactor diodes.

25. The artificial magnetic conductor (AMC) of claim 24 further comprising ballast resistors coupled in parallel with the varactor diodes.

5 26. An artificial magnetic conductor (AMC) comprising:
a frequency selective surface (FSS) including a periodic array of
conductive patches;
a spacer layer including vias extending therethrough in association with
predetermined conductive patches of the FSS; and
10 a conducting backplane structure including two or more bias signal lines,
the AMC characterized by a unit cell including
in a first plane, a pattern of three or more conductive patches disposed on a
first side of a dielectric layer, each conductive patch electrically
coupled with an associated conductive via, and radio frequency
(RF) switch elements between laterally adjacent conductive patches,
each conductive patch overlapping at least in part a spaced
conductive patch of a plurality of spaced conductive patches
disposed on a second side of the dielectric layer; and
in a second plane, a conductive backplane segment extending in a plane
20 substantially parallel to a plane including the three or more
conductive patches and the associated conductive vias extending
from the each conductive patch to one of the two or more bias signal
lines.

25 27. The AMC of claim 26 wherein the each conductive patch overlaps a
spaced conductive patch which is common with horizontally adjacent and
vertically adjacent unit cells of the FSS.

30 28. The artificial magnetic conductor (AMC) of claim 26 wherein the
RF switch elements comprise PIN diodes.

29. The artificial magnetic conductor (AMC) of claim 26 wherein the RF switch elements comprise microelectrical-mechanical system (MEMS) switches.

30. A method for reconfiguring an artificial magnetic conductor (AMC) including a frequency selective surface (FSS) having a pattern of conductive patches, a conductive backplane structure and a spacer layer separating the FSS and the conductive backplane structure, the method comprising:

applying control bias signals to voltage variable capacitive elements associated with the FSS; and
thereby, reconfiguring effective sheet capacitance of the FSS.

31. The method of claim 30 wherein applying bias control signals comprises applying the bias control signals to conductors located in the conductive backplane structure and coupled to selected conductive patches by conductors extending through the spacer layer.

32. The method of claim 30 further comprising:
tuning a resonant frequency of the AMC.

33. An artificial magnetic conductor (AMC) comprising:
a frequency selective surface (FSS) having a pattern of conductive patches;
a conductive backplane structure; and
a spacer layer separating the FSS and the conductive backplane structure,
the spacer layer including conductive vias associated with some but
not all patches of the pattern of conductive patches.

34. The AMC of claim 33 wherein the conductive backplane structure comprises at least one ground plane, the conductive vias being in electrical contact with the at least one ground plane.

35. The AMC of claim 33 wherein the FSS comprises:
a first set of conductive patches on one side of an FSS dielectric layer, and
a second set of conductive patches on a second side of an FSS dielectric
layer.

36. The AMC of claim 35 wherein the spacer layer has conductive vias
associated with some or all of only the first set of conductive patches.

37. The AMC of claim 36 wherein the spacer layer has conductive vias
associated with some or all of only the second set of conductive patches.

38. The AMC of claim 33 wherein the conductive backplane structure
comprises bias signal lines in electrical contact with at least a subset of the
conductive vias.

39. The AMC of claim 38 wherein the conductive backplane structure
further comprises at least one ground plane, at least a second subset of the
conductive vias being in electrical contact with the at least one ground plane.

40. The AMC of claim 33 wherein the FSS comprises:
a layer of conductive patches on one side of a dielectric layer.

41. The AMC of claim 33 wherein the FSS comprises:
a layer of conductive patches on one side of a tunable dielectric layer.

42. The AMC of claim 33 wherein the FSS comprises:
a first layer of conductive patches on one side of a tunable dielectric film;
and
a second layer of conductive patches on a second side of the tunable
dielectric film.

43. The AMC of claim 42 wherein the spacer layer comprises:
a first set of conductive vias associated with at least some patches of the
first layer of conductive patches; and
a second set of conductive vias associated with at least some patches of the
second layer of conductive patches.

44. A high impedance surface comprising:
a frequency selective surface (FSS) patterned with conductive patches;
a conductive ground plane; and
a layer separating the FSS and the conductive backplane structure, the layer
including a dielectric material pierced by a partial forest of
conductive vias.

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